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Volume V
Part 29

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INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 29 - Data Aggregators Product Specification

M. Apicella, J. Slaton, B. Levi

Control Data Corporation
Integration Technology Services
2970 Presidential Drive
Fairborn, OH 45324-6209

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WRIGHT RESEARCH AND DEVELOPMENT CENTER
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WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6533

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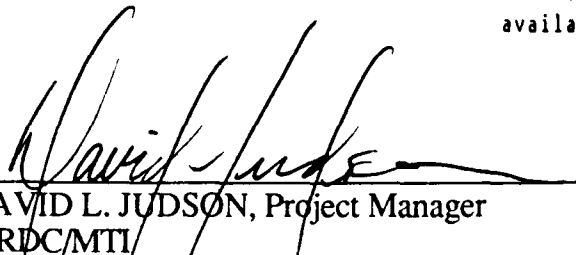
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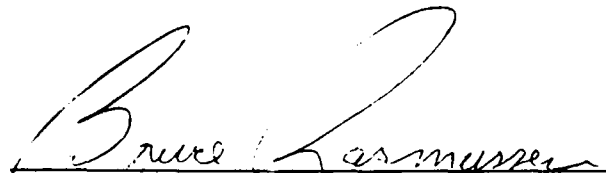
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DAVID L. JUDSON, Project Manager
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

FOR THE COMMANDER:


BRUCE A. RASMUSSEN, Chief
WRDC/MTI
Wright-Patterson AFB, OH 45433-6533

25 July 91
DATE

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FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

<u>SUBCONTRACTOR</u>	<u>ROLE</u>
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

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SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of the "Aggregator Functions", one of the major functions of the Configuration Item "Common Data Model Processor (CDMP)" to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDM).

1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to aggregate the query output files and produce the result file of the aggregation.

The following functions are performed by all four aggregators.

1. This CPCI receives and unpacks a message from the Network Transaction Manager and builds the appropriate tables that contain the descriptions of the files that are to be aggregated (except the NOT IN SET aggregator).
2. A sort is performed on both input files based on the key(s) of each file.
3. Individual Aggregator Functions:
 - a. UNION: The Union Aggregator does a sort/merge to combine the two files into the result file. The sort/merge is based on ascending values with a compare between each key in each file. The result file contains the combined input files.
 - b. NOT IN SET: The NIS Aggregator compares the two sorted input files based on the keys and determines if any key value from the first input file is in the second input file. If true, then the record from the first input file is discarded and the compare continues looking for file 1 keys that do not match file 2 keys. The results file contains input file 1 records that do not match.
 - c. JOIN: The Join Aggregator combines two sorted input files based on the keys and determines if the key value from the first input file is equal to the keys in second input file. If false, then the record is discarded. If true, the record is used to form the result file.
 - d. OUTERJOIN: The Outer Join combines two sorted files based on the keys and determines if the key value from the first input file is equal to the keys in

the second input file. If true, both records are used to form the results file. If false, fields from the first record are used and null values are used for fields from the second record.

4. The results of each aggregator are written to a result file described in the initial message.
5. The aggregators send a completion message to the NTM containing the status of the aggregation, the name of the result file and the count of the records in the file.

SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.
2. D. Appleton Co, CDM Administrators Manual: UM620141000, March 1984.
3. D. Appleton Co., CDM1-IDEF1 Model of the Common Data Model; CCS620141000, 15 May 1985.
4. D. Appleton Co., Computer Program Development Specification (DS) for Integrated Support System (IISS) Configuration Item: NDML Precompiler; DS620141200, October 1984.
5. D. Appleton Co., Embedded NDML Programmer's Reference Manual: PRM620141200, March 1985.
6. Softech, Inc., NTM Programmer's Guide: UM620140001, July 1984
7. Control Data Corporation, Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc., of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer reference data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routines available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System:: (IISS) A test computing environment used to investigate, demonstrate, and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

Mapping: The correspondence of independent objects in two schemas: ES to CS or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication, and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieval and single node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp., Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing sections source code of the input application program.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3

REQUIREMENTS

3.1 Structural Description

The graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationship of each module making up this CPCI.

All Aggregators use the lower level module to handle specific operations. An example of this type of operation is the sort/merge utility to combine two input files, open, read, write, and close the files and also comparing the key fields in each file.

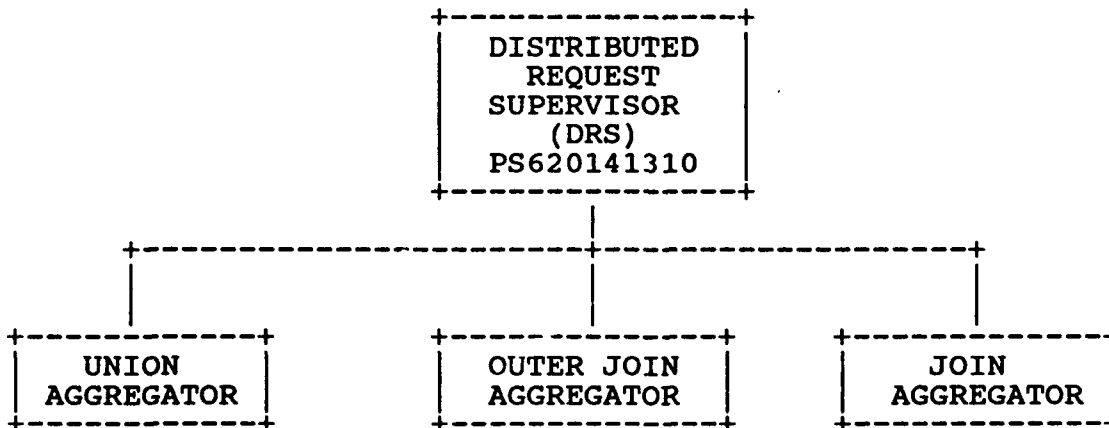
3.2 Functional Flow

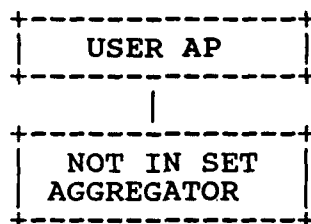
This CPCI implemented the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, the Network Transaction Manager. It currently can only be executed on the DEC VAX due to the dependence on the VAX sort although this has been identified for change for execution on the IBM.

3.3 Interfaces

The following diagram depicts the interface of the Aggregator and the other CPCI's.





3.3.1 Inputs/Outputs

The following table shows the inputs and outputs of this CPCI. A detailed description for each item can be found in the DS for this CPCI.

INPUT	OUTPUT
UNION: Input File Names Attribute Pair List (Keys) Results Field Table (Key Desc)	Result File Name Status
NOT IN SET: Input File Names Attribute Pair List Results Field Table for Each Input File Results Field Table for Results File	Result File Name Status Number of Records in Result File
OUTER JOIN: Input File Names Attribute Pair List (Keys) Results Field Table for each Input File Results Field Table for Results File	Result File Name Status Number of Records in Result File
JOIN: Input File Names Attribute Pair List (Keys) Results Field Table for each Input File Results Field Table for Results File	Result File Name Status Number of Records in Result File

3.4 Program Interrupts

Not applicable to this CPCI.

3.5 Timing and Sequencing Description

This CPCI is activated for each aggregation called for by the distributed request supervisor (DRS).

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. The model is defined by the CDM1, the IDEF1 model of the CDM, Reference Document Number 3.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It may use temporary scratch files for input and output results.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.7.1.3 Item Description

Not applicable to this CPCI.

3.8 Object Code Creation

The object code for this CPCI will be created by the system integration team using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL and C language compilers.

3.9 Adaptation Data

This CPCI has been using ANSI COBOL and a "standard" subset of the C language. The intent was to provide a transportable system. Any system environment supporting these languages, a virtual memory management schema, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to localize and identify any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Where Include File Used List

The following lists each include file in the documentation group and all the modules documented in this specification which include them. The purpose of each module is listed as well.

DOCGROUP PS41320 Where-include-file-used List

Include File -----	Module Name -----
RFTABLE	CDJ01 CDJS1 CDNS1 CDOJ1 CDOJS1 CDU01 CDUS1
APL	CDJ01 CDJS1 CDNS1 CDOJ1 CDOJS1
AGGMSG	CDJ01 CDOJ1 CDU01
STDRESP	CDJ01 CDOJ1 CDU01
CHKCDM	CDJ01 CDJS1 CDNS1 CDOJ1 CDOJS1 CDU01 CDUS1
ERRCDM	

DOCGROUP PS41320 Where-include-file-used List

Include File -----	Module Name -----
	CDJ01
	CDJS1
	CDMPSOR
	CDNS1
	CDOJ1
	CDOJS1
	CDU01
	CDUS1
SRVRET	
	CDJ01
	CDOJ1
	CDU01
ERRPRO	
	CDJ01
	CDJS1
	CDMPSOR
	CDNS1
	CDOJ1
	CDOJS1
	CDU01
	CDUS1
ERRFS	
	CDJS1
	CDMPSOR
	CDNS1
	CDOJS1
	CDUS1

3.10.2 Where External Routine Used List

The following lists each external function or routine in the documentation group and all the documented modules which call it. The purpose of each module is listed as well.

DOCGROUP PS41320 Where-external-routine-used List

System Module -----	Module Name -----
INITAL	CDJ01 CDOJ1 CDU01
RCV	CDJ01 CDOJ1 CDU01
SIGERR	CDJ01 CDOJ1 CDU01
NSEND	CDJ01 CDOJ1 CDU01
TRMNAT	CDJ01 CDOJ1 CDU01
ERRPRO	CDJ01 CDJS1 CDMPSOR CDNS1 CDOJ1 CDOJS1 CDU01 CDUS1
NAMFIL	CDJS1

DOCGROUP PS41320 Where-external-routine-used List

System Module -----	Module Name -----
OPNFIL	CDNS1
	CDOJS1
AGGCDN	CDJS1
	CDNS1
	CDOJS1
	CDUS1
INPFIL	CDJS1
	CDNS1
	CDOJS1
SEKFIL	CDUS1
	CDJS1
OUTFIL	CDOJS1
	CDJS1
CLSFIL	CDNS1
	CDOJS1
	CDUS1
	CDJS1
SRTFIL	CDNS1
	CDOJS1
	CDUS1
	CDMPSOR

DOCGROUP PS41320 Where-external-routine-used List

System Module -----	Module Name -----
LIB\$INDEX	CHREAL

3.10.3 Main Program Parts List

The following lists each Main Program in the documentation group and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more than once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external routine". The Purpose of the Main Program module is listed as well.

DOCGROUP PS41320 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
CDJ01	INITAL	External routine
	RCV	External routine
	SIGERR	External routine
	CDJS1	Well-defined module
	NSEND	External routine
	TRMNAT	External routine
	ERRPRO	External routine
CDJS1	ERRPRO	External routine
	NAMFIL	External routine
	CDMPSOR	Well-defined module
	OPNFIL	External routine
	AGGCDN	External routine
	INPFIL	External routine
	SEKFIL	External routine
	OUTFIL	External routine
	CLSFIL	External routine
CDMPSOR	ERRPRO	External routine
	SRTFIL	External routine
CDNS1	ERRPRO	External routine
	NAMFIL	External routine
	CDMPSOR	External routine
	OPNFIL	External routine
	AGGCDN	External routine
	INPFIL	External routine
	OUTFIL	External routine
	CLSFIL	External routine
CDOJ1		

DOCGROUP PS41320 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
	INITAL	External routine
	RCV	External routine
	SIGERR	External routine
	NSEND	External routine
	TRMNAT	External routine
	ERRPRO	External routine
	CDOJS1	Well-defined module
CDOJS1	ERRPRO	External routine
	NAMFIL	External routine
	CDMPSOR	External routine
	OPNFIL	External routine
	AGGCDN	External routine
	INPFIL	External routine
	SEKFIL	External routine
	OUTFIL	External routine
	CLSFIL	External routine
CDU01	INITAL	External routine
	RCV	External routine
	SIGERR	External routine
	NSEND	External routine
	TRMNAT	External routine
	ERRPRO	External routine
	CDUS1	Well-defined module
CDUS1	ERRPRO	External routine
	OPNFIL	External routine
	INPFIL	External routine
	OUTFIL	External routine
	CLSFIL	External routine

DOCGROUP PS41320 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
CHREAL		
CHRINT	LIB\$INDEX	External routine
RELFTN		

3.10.4 Module Documentation

The following documentation describes information which is specific to each individual module in the documentation group being documented in this specification. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.
SUBDIRECTORY:	Sub-directory of that subsystem in which this file resides.

DOCUMENTATION GROUP: Name of documentation group of which this source file is a member.

DESCRIPTION: A description of the module as obtained from the source code.

ARGUMENTS: The arguments with which this routine is called if it is a Subroutine or a Function.

INCLUDE FILES: A list of all the files that are included into this module as well as their purposes.

ROUTINES CALLED: Subroutines or Functions, either documented or external, called by this module, if any.

CALLED DIRECTLY BY: The documented routines which call this module, if any.

USED IN MAIN PROGRAM(S): The documented Main Programs which contain this module in their parts list according to the list in section 3.10.3.

The Module Documentation is arranged alphabetically according to Module Name.

DOCGROUP PS41320 Module Documentation

NAME: CDJ01
PURPOSE: CDJ01 CONTROLS PROCESSING LOGIC FOR JOIN AGGREGATOR
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDJ01
SOURCE FILE TYPE: COB
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

THE OBJECTIVE OF THIS CONFIGURATION ITEM IS TO PERFORM RELATION JOINS UPON INTERMEDIATE RESULTS OF A MULTI-DATABASE TRANSACTION. IT, ALONG WITH THE DISTRIBUTED REQUEST SUPERVISOR CI AND REQUEST PROCESSORS, PERFORM THE RUN TIME EVALUATION OF COMMANDS PRESENTED TO THEM BY APPLICATION PROCESSES.

I B M N O T E

VAX SPECIFIC ITEMS WILL BE MARKED WITH AN IBM COMMENT TO DENOTE CHANGES THAT MUST BE MADE TO HOST THIS MODULE TO THE IBM

MODIFICATION 10/86:
FILE NAMES HAVE BEEN CHANGED FROM 30 TO 80
CHARACTERS TO SUPPORT THE ADDITION OF FILE I/O
PRIMITIVES FOR REHOST TO IBM

INCLUDE FILES:

RFTABLE
APL
AGGMSG
STDRESP
CHKCDM
ERRCDM
SRVRET
ERRPRO

ROUTINES CALLED:

INITAL
RCV
SIGERR
CDJS1
NSEND
TRMNAT
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDJS1
PURPOSE: AGGREGATOR JOIN FUNCTION
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDJS1
SOURCE FILE TYPE: COB
HOST: IBM
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

*****NOTICE*****

I B M N O T E

VAX SPECIFIC ITEMS WILL BE MARKED WITH AN
IBM COMMENT TO DENOTE CHANGES THAT MUST BE
MADE TO HOST THIS MODULE TO THE IBM

ARGUMENTS:

AGG-FILE-INPUT-1	DSPLY[X(80)]
AGG-FILE-INPUT-2	DSPLY[X(80)]
JQG-ATTRIBUTE-PAIR-LIST	RECRD
RFT	RECRD
RFT2	RECRD
RFTR	RECRD
STD-RECORD-CNT	DSPLY[9(6)]
STD-FILENAME	DSPLY[X(80)]
STD-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
APL
RFTABLE
ERRPRO

ROUTINES CALLED:

AMFIL
CDMPSOR
OPNFIL
AGGCDN
INPFIL
SEKFIL
OUTFIL
CLSFIL
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDMPSOR
PURPOSE: AGGREGATOR SORT ROUTINE
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDMPSOR
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

- THE OBJECTIVE OF THIS CONFIGURATION ITEM IS TO SORT THE INPUT FILE THAT MEETS THE QUALIFICATIONS OF THE RECORD "INPUT-FILE"

MODIFICATION 9/86:

VAX SYSTEM DEPENDANT SORTS WERE REMOVED
AND FILE INPUT/OUTPUT PRIMITIVE "SRTFIL"
WAS SUBSTITUTED TO SUPPORT REHOST EFFORT

ARGUMENTS:

INPUT-FILE	RECRD
TEMP-FILE-NAME	DSPLY[X(80)]
MESG-DESC	DSPLY[X(60)]
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

ERRCDM
ERRFS
ERRPRO

ROUTINES CALLED:

SRTFIL
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDNS1
PURPOSE: AGGREGATOR NOT IN SET FUNCTION
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDNS1
SOURCE FILE TYPE: COB
HOST: IBM
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

-

THE OBJECTIVE OF THIS CONFIGURATION ITEM IS TO
PERFORM RELATION NOT IN SETS UPON INTERMEDIATE RESULTS
OF A MULTI-DATABASE TRANSACTION. IT, ALONG WITH
THE DISTRIBUTED REQUEST SUPERVISOR CI AND REQUEST PROCESSORS,
PERFORM THE RUN TIME EVALUATION OF COMMANDS PRESENTED
TO THEM BY APPLICATION PROCESSES.

I B M N O T E

VAX SPECIFIC ITEMS WILL BE MARKED WITH AN
IBM COMMENT TO DENOTE CHANGES THAT MUST BE
MADE TO HOST THIS MODULE TO THE IBM

THE NOT IN SET AGGREGATOR PERFORMS THE FOLLOWING:

1. IT RECEIVES THE INPUT FILE NAMES, APL AND RFT TABLES FOR
THE TWO OPERAND RELATION AND RESULTANT RELATION.
2. IT PERFORMS A SORT/COMPARE OPERATION ON THE OPERAND
RELATION CREATING THE RESULTANT RELATION.
3. IT RETURNS VARIABLES TO THE USER AP
WHICH INCLUDE PROGRAM STATUS, RESULTANT RELATION AND
THE NUMBER OF RECORDS IN THE RESULTANT RELATION.

ARGUMENTS:

USER-AP-INPUT-1	DSPLY[X(80)]
USER-AP-INPUT-2	DSPLY[X(80)]
JQG-ATTRIBUTE-PAIR-LIST	RECRD
RFT	RECRD
RFT2	RECRD
STD-RECORD-CNT	DSPLY[9(6)]
STD-FILENAME	DSPLY[X(80)]
STD-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
APL
RFTABLE
ERRPRO

ROUTINES CALLED:

NAMFIL
CDMPSON
OPNFIL
AGGCDN
INPFIL
OUTFIL
CLSFIL
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDOJ1
PURPOSE: CDOJ1 CONTROLS PROCESSING LOGIC FOR OTJOIN AGGREGATOR
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDOJ1
SOURCE FILE TYPE: COB
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

THE OBJECTIVE OF THIS CONFIGURATION ITEM IS TO
PERFORM RELATION OUTER JOINS UPON INTERMEDIATE RESULTS
OF A MULTI-DATABASE TRANSACTION. IT, ALONG WITH
THE DISTRIBUTED REQUEST SUPERVISOR CI AND REQUEST PROCESSORS,

PERFORM THE RUN TIME EVALUATION OF COMMANDS PRESENTED
TO THEM BY APPLICATION PROCESSES.

I B M N O T E

VAX SPECIFIC ITEMS WILL BE MARKED WITH AN
IBM COMMENT TO DENOTE CHANGES THAT MUST BE
MADE TO HOST THIS MODULE TO THE IBM

INCLUDE FILES:

RFTABLE
APL
AGGMSG
STDRESP
CHKCDM
ERRCDM
SRVRET
ERRPRO

ROUTINES CALLED:

INITAL
RCV
SIGERR
CDOJS1
NSEND
TRMNAT
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDOJS1
PURPOSE: AGGREGATOR OUTER JOIN FUNCTION
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDOJS1
SOURCE FILE TYPE: COB
HOST: IBM
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

I B M N O T E

VAX SPECIFIC ITEMS WILL BE MARKED WITH AN
IBM COMMENT TO DENOTE CHANGES THAT MUST BE
MADE TO HOST THIS MODULE TO THE IBM

MODIFICATIONS 10/86:

THE FOLLOWING CHANGES HAVE BEEN MADE IN ORDER TO SUPPORT
THE ADDITION OF FILE I/O PRIMITIVES FOR REHOST TO IBM:
FILE NAMES HAVE BEEN CHANGED FROM 30 TO 80 CHARACTERS

CALLS TO "WHTHST" AND "GENFIL" HAVE BEEN REPLACED WITH
CALL TO FILE I/O PRIMITIVE "NAMFIL"
CALL TO FORTRAN "AGGOPEN" HAS BEEN REPLACED WITH
CALL TO FILE I/O PRIMITIVE "OPNFIL"
CALL TO FORTRAN "AGGREAD" HAS BEEN REPLACED WITH
CALL TO FILE I/O PRIMITIVE "INPFIL"
CALL TO FORTRAN "AGGBSP" HAS BEEN REPLACED WITH
CALL TO FILE I/O PRIMITIVE "SEKFIL"
CALL TO FORTRAN "AGGWRT" HAS BEEN REPLACED WITH
CALL TO FILE I/O PRIMITIVE "OUTFIL"
CALL TO FORTRAN "AGGCLOS" AND COBOL "DELFIL" HAVE
BEEN REPLACED WITH CALL TO FILE I/O PRIMITIVE
"CLSFIL"
3/88 - REMOVED DESCRIPTOR/REFERENCE ON CALL TO AGGCDN.

ARGUMENTS:

AGG-FILE-INPUT-1	DSPLY[X(80)]
AGG-FILE-INPUT-2	DSPLY[X(80)]
JQG-ATTRIBUTE-PAIR-LIST	RECRD
RFT	RECRD
RFT2	RECRD
RFTR	RECRD
STD-RECORD-CNT	DSPLY[9(6)]
STD-FILENAME	DSPLY[X(80)]
STD-STATUS	DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
APL
RFTABLE
ERRPRO

ROUTINES CALLED:

NAMFIL
CDMPSOR
OPNFIL
AGGCDN
INPFIL
SEKFIL
OUTFIL
CLSFIL
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDU01
PURPOSE: AGGREGATOR UNION FUNCTION
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDU01
SOURCE FILE TYPE: COB
HOST: VAX
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

THE OBJECTIVE OF THIS CONFIGURATION ITEM IS TO
PERFORM RELATION UNIONS UPON INTERMEDIATE RESULTS
OF A MULTI-DATABASE TRANSACTION. IT, ALONG WITH
THE STAGER/SCHEDULER CI AND QUERY PROCESSORS,
PERFORM THE RUN TIME EVALUATION OF COMMANDS PRESENTED
TO THEM BY APPLICATION PROCESSES.
MODIFICATION 10/86: FILE NAME SIZE HAS BEEN INCREASED
FROM 30 TO 80 CHARACTERS TO SUPPORT
THE ADDITION OF FILE I/O PRIMITIVES
USED FOR REHOST TO IBM SYSTEM

THE UNION AGGREGATOR PERFORMS THE FOLLOWING:

1. IT RECEIVES AND UNPACKS A MESSAGE FROM THE NTM
AND BUILDS APPROPRIATE TABLES FOR THE
TWO OPERAND RELATION AND RESULTANT RELATION.
2. A SUBROUTINE (CDUS1) IS THEN CALLED TO PERFORM
THE UNION FUNCTION. FILE 2 IS APPENDED TO THE
FIRST FILE.
3. IT SENDS A COMPLETION MESSAGE TO THE DISTRIBUTED REQUEST
SUPERVISOR WHICH CONTAINS PROGRAM STATUS, THE RESULT
FILE NAME, AND A RECORD COUNT OF 1. THE DRS WILL COUNT
THE NUMBER OF RECORDS BASED ON THE NUMBER OF RECORDS IN
EACH INPUT FILE.

INCLUDE FILES:

RFTABLE
AGGMSG
STDRESP
ERRCDM
CHKCDM
SRVRET
ERRPRO

ROUTINES CALLED:

INITAL
RCV
SIGERR
CDUS1
NSEND
TRMNAT
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CDUS1
PURPOSE: UNION AGGREGATOR subroutine calls FORTRAN subroutines
LANGUAGE: VAX-11 COBOL
SOURCE FILE: CDUS1
SOURCE FILE TYPE: COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

MODIFICATION 10/86:
TO SUPPORT ADDITION OF FILE I/O PRIMITIVES NEEDED
FOR REHOST TO THE IBM THE FOLLOWING CHANGES HAVE
BEEN MADE.
FILE NAMES HAVE BEEN INCREASED FROM 30 TO 80
CHARACTERS
CALL TO "AGGOPEN" HAS BEEN REPLACED BY CALL
TO FILE I/O PRIMITIVE "OPNFIL"
CALL TO "AGGREAD" HAS BEEN REPLACED BY CALL
TO FILE I/O PRIMITIVE "INPFIL"
CALL TO "AGGWRT" HAS BEEN REPLACED BY CALL
TO FILE I/O PRIMITIVE "OUTFIL"
CALLS TO "AGGCLOS" AND "DELFIL" HAVE BEEN
REPLACED BY CALL TO FILE I/O PRIMITIVE "CLSFIL"

ARGUMENTS:

AGG-INPUT1-01 DSPLY[X(80)]
AGG-INPUT2-01 DSPLY[X(80)]
RESULTS-FILE-NAME DSPLY[X(80)]
RFT RECRD
RET-STATUS DSPLY[X(5)]

INCLUDE FILES:

CHKCDM
ERRCDM
ERRFS
RFTABLE
ERRPRO

ROUTINES CALLED:

OPNFIL
INPFIL
OUTFIL
CLSFIL
ERRPRO

DOCGROUP PS41320 Module Documentation

NAME: CHREAL
PURPOSE: CHARACTER TO REAL CONVERSIONS
LANGUAGE: VAX-11 FORTRAN
SOURCE FILE: CHREAL
SOURCE FILE TYPE: FOR
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

**

DESCRIPTION:

ROUTINES CALLED:

LIB\$INDEX

ARGUMENTS:

STRING	CHAR
REALVA	R*4
RC	I*4

DOCGROUP PS41320 Module Documentation

NAME: CHRINT
PURPOSE: CHARACTER TO INTEGER CONVERSION
LANGUAGE: VAX-11 FORTRAN
SOURCE FILE: CHRINT
SOURCE FILE TYPE: FOR
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

**

DESCRIPTION:

ARGUMENTS:

STRING	CHAR
INTGR	I*4
RC	I*4

DOCGROUP PS41320 Module Documentation

NAME: RELFTN
PURPOSE: CONVERT REAL NUMBER TO CHARACTER STRING **
LANGUAGE: VAX-11 FORTRAN
SOURCE FILE: RELFTN
SOURCE FILE TYPE: FOR
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY: CDMR

DESCRIPTION:

ARGUMENTS:

DECMAL	I*4
REALIN	R*4
CHROTL	CHAR

3.10.5 Include File Descriptions

The following list contains a purpose and description of each include file in the documentation group as specified in the source code. The language it is written in is also given.

DOCGROUP PS41320 Include File Description

FILE NAME: AGGMSG
PURPOSE: AGGREGATOR INPUT MESSAGE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS THE FORMAT OF THE INPUT MESSAGE FOR THE
CDMP AGGREGATORS

DESCRIPTION :-

AGGREGATOR INPUT MESSAGE FORMAT

NIS = NOT IN SET

DOCGROUP PS41320 Include File Description

FILE NAME: APL
PURPOSE: JOIN QUERY ATTRIBUTE PAIR LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INFORMATION ABOUT THE JOIN
ATTRIBUTES FOR NDML SUBTRANSACTIONS

DOCGROUP PS41320 Include File Description

FILE NAME: CHKCDM
PURPOSE: IISS CDMF CHECK STATUS CODES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL STATUS CODES FOR THE *
CDMF MODULES *

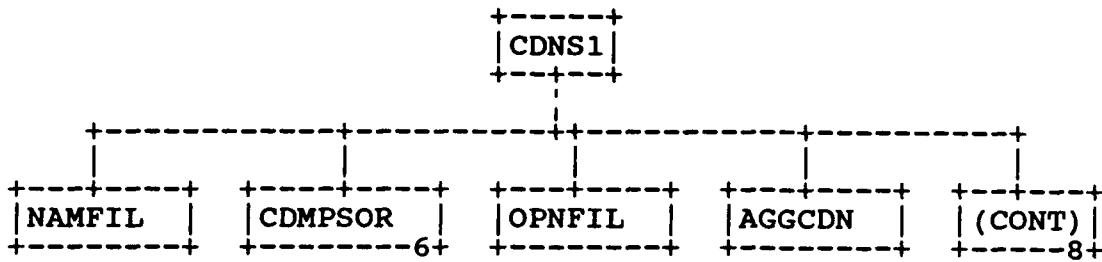
DOCGROUP PS41320 Include File Description

FILE NAME: ERRCDM
PURPOSE: IISS ERROR STATUS CODES FOR CDMF MODULES
LANGUAGE: VAX-11 COBOL

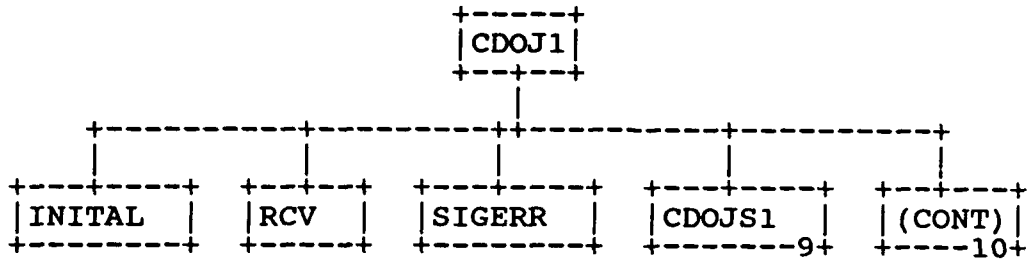
DESCRIPTION:

CONTAINS ALL ERROR CODES USED BY CDMF *
MODULES FOR ERROR HANDLING *

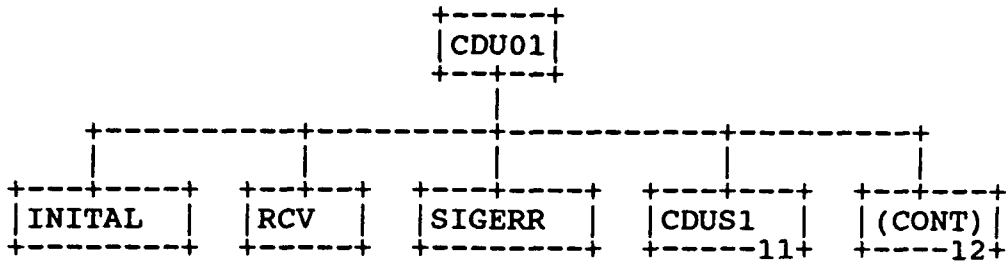
3



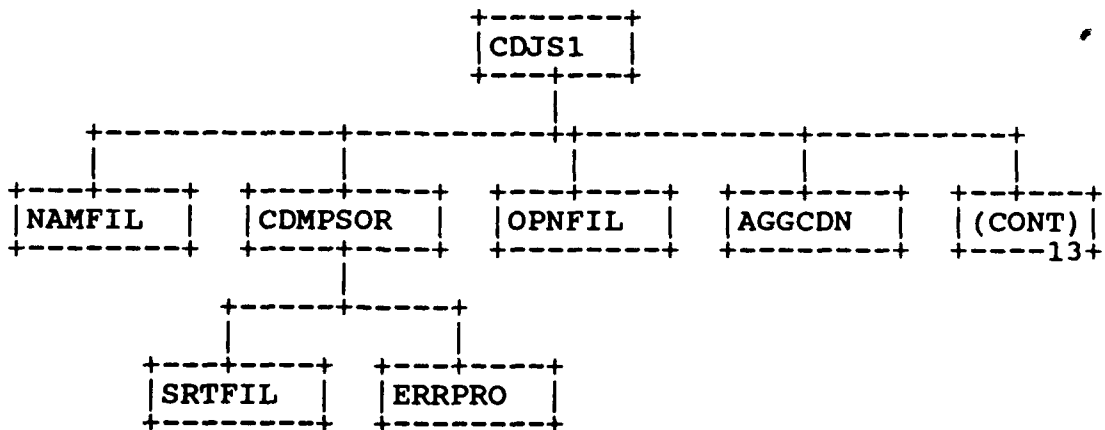
4



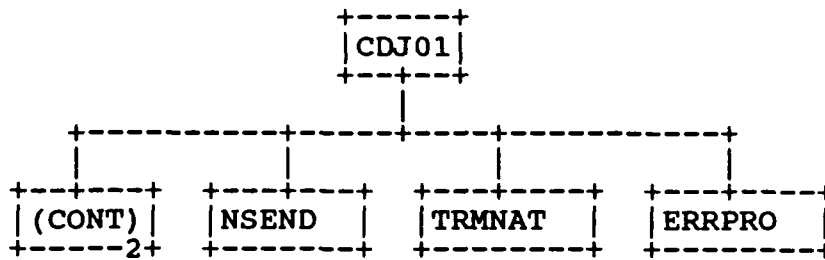
5



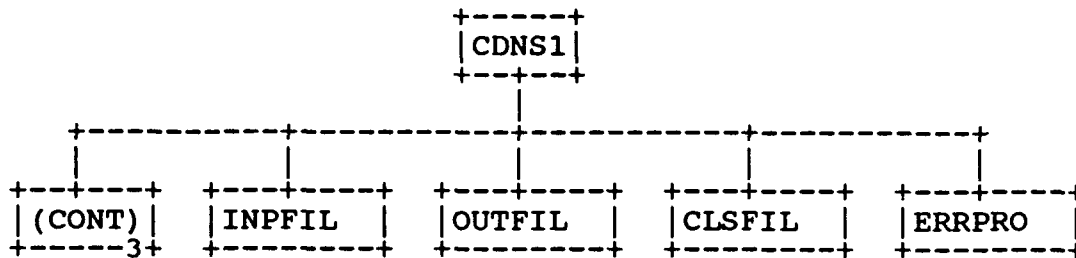
6



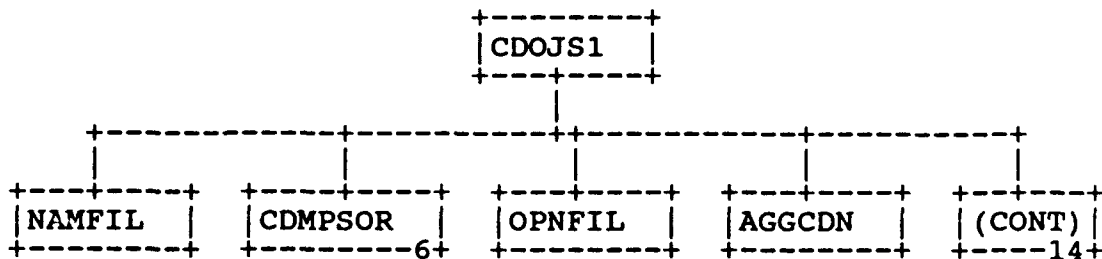
7



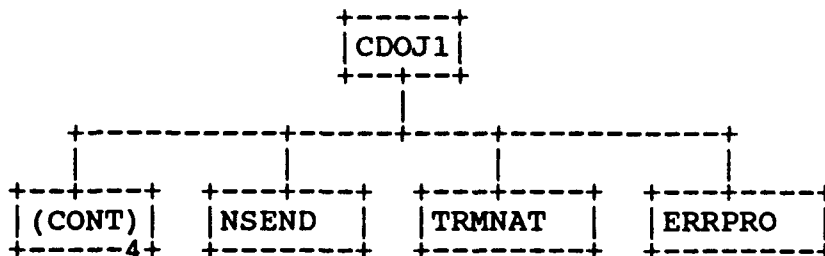
8



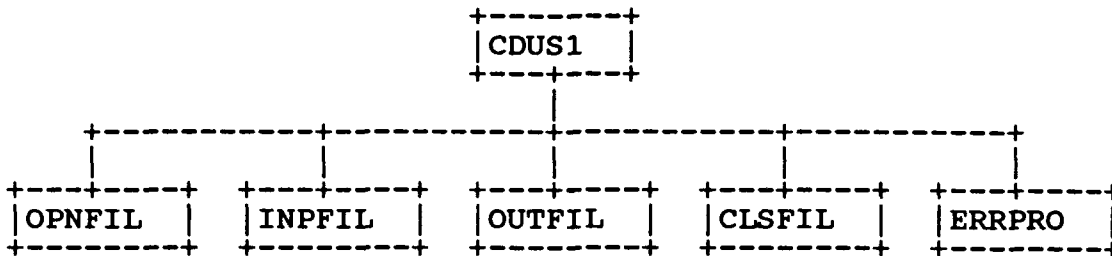
9



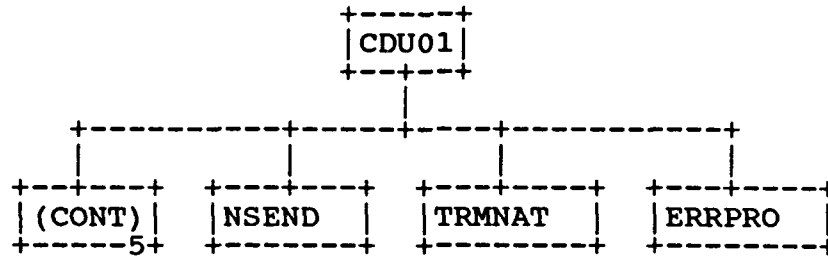
10



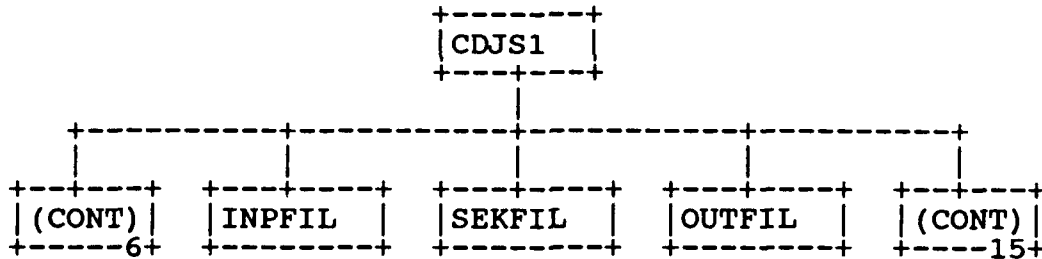
11



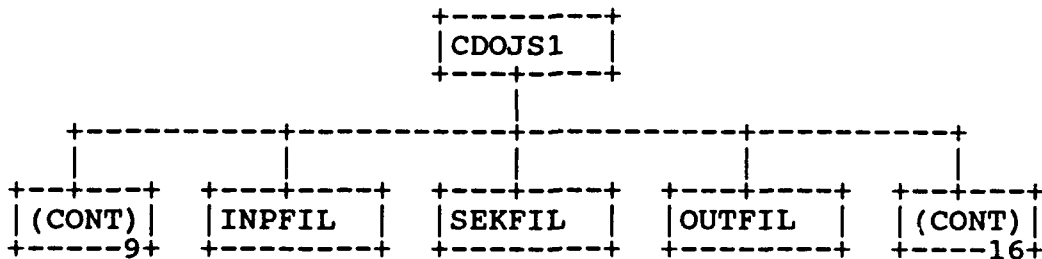
12



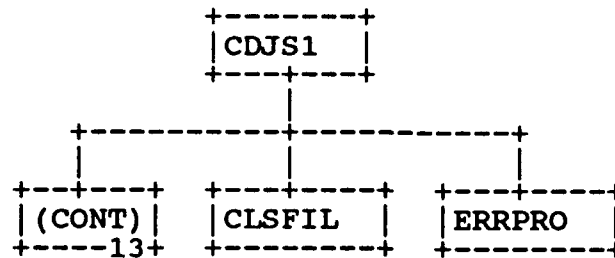
13



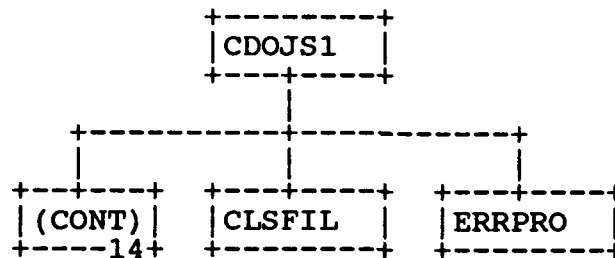
14



15



16



AGGCDN
CDJ01.....2
CDJS16
CDMPSOR6
CDNS1.....3
CDOJ1.....4
CDOJS19
CDU01.....5
CDUS111
CHREAL.....1
CLSFIL
ERRPRO
INITAL
INPFIL
LIB\$INDEX
NAMFIL
NSEND
OPNFIL
OUTFIL
RCV
SEKFIL
SIGERR
SRTFIL
TRMNAT

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."